HDS300 Dual Channel Series

Handheld Oscilloscope Quick Guide

- **HDS307S**
- **HDS310S**
- **HDS320S**



For product support, visit: www.owon.com.hk/download

※： The illustrations, interface, icons and characters in the user manual may be slightly different from the actual product. Please refer to the actual product.

Oct 2024 edition V1.0.4

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General Warranty

We warrant that the product will be free from defects in materials and workmanship for a period of 3 years from the date of purchase of the product by the original purchaser from the our Company. The warranty period for accessories such as probes, adapter is 12 months. This warranty only applies to the original purchaser and is not transferable to a third party.

If the product proves defective during the warranty period, we will either repair the defective product without charge for parts and labour, or will provide a replacement in exchange for the defective product. Parts, modules and replacement products used by our company for warranty work may be new or reconditioned like new. All replaced parts, modules and products become the property of our company.

In order to obtain service under this warranty, the customer must notify our company of the defect before the expiration of the warranty period. Customer shall be responsible for packaging and shipping the defective product to the designated service centre, a copy of the customers proof of purchase is also required.

This warranty shall not apply to any defect, failure or damage caused by improper use or improper or inadequate maintenance and care. We shall not be obligated to furnish service under this warranty a) to repair damage resulting from attempts by personnel other than our company representatives to install, repair or service the product; b) to repair damage resulting from improper use or connection to incompatible equipment; c) to repair any damage or malfunction caused by the use of not our supplies; or d) to service a product that has been modified or integrated with other products when the effect of such modification or integration increases the time or difficulty of servicing the product.

Please contact the nearest Sales and Service Offices for services.

Excepting the after-sales services provided in this summary or the applicable warranty statements, we will not offer any guarantee for maintenance definitely declared or hinted, including but not limited to the implied guarantee for marketability and special-purpose acceptability. We should not take any responsibilities for any indirect, special or consequent damages.

Table of Contents

1. SAFETY INFORMATION 1

2. HOW TO IMPLEMENT THE GENERAL INSPECTION 4

3. HOW TO USE THE OSCILLOSCOPE 5

The Structure of the Oscilloscope 5

Front Panel and Keys 5

Side Panel 7

Introduction to the User Interface of the Oscilloscope 8

Functional Check 9

Probe Compensation 10

Probe Attenuation Coefficient Setting 11

Safe Use of Probe 12

4. HOW TO USE THE MULTIMETER 13

About This Chapter 13

Instrument Interface 13

5. HOW TO USE THE WAVEFORM GENERATOR（OPTIONAL） 15

Connect the output 15

Set the waveform 15

6. TROUBLESHOOTING 16

7. APPENDIX 18

Appendix A: List of Accessories 18

Appendix B: Maintenance and Cleaning 18

1. Safety Information

(Before using this product, please read the safety information in advance)

Safety Terms

Terms in this manual (The following terms may appear in this manual):

Warning: Warning indicates conditions or practices that could result in injury or loss of life.

Caution: Caution indicates the conditions or practices that could result in damage to this product or other property.

Terms on the product. The following terms may appear on this product:

Danger: Indicates an immediate hazard or injury possibility.

Warning: Indicates a possible hazard or injury.

Caution: Indicates potential damage to the instrument or other property.

Safety Symbols

Symbols on the product. The following symbol may appear on the product:


Hazardous Voltage


Refer to Manual


Protective Earth Terminal


Chassis Ground


Test Ground

Safety Requirements

Please read the following safety precautions to avoid personal injury and prevent damage to this product or any other products connected to it. In order to avoid possible hazards, this product can only be used within the specified range.

⚠Warning:

To prevent electric shock or fire, use a suitable power adapter. Only power adapters that are dedicated to this product and approved for use in the country of use may be used.

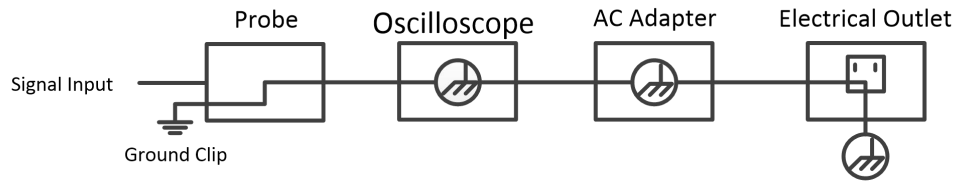
⚠Warning:

The two channels of the oscilloscope are non-isolated channels. Note that the channel should use a common reference when measuring, and the ground wires of the two probes cannot be connected to two non-isolated places with different DC electrical levels, otherwise it may cause a short circuit due to the ground wire connection of the oscilloscope probe.

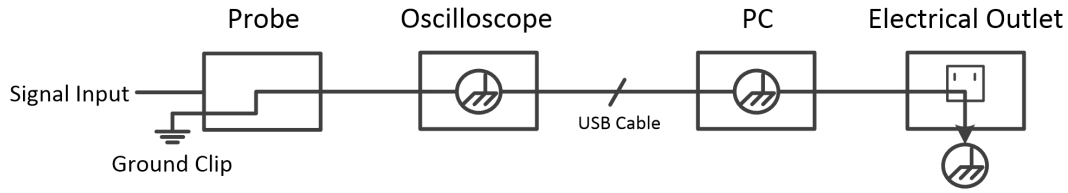
⚠Warning:

Note that the channel should use a common reference when measuring, otherwise it may cause a short circuit due to the ground wire connection of the oscilloscope probe.

Schematic diagram of the internal ground wire connection of the oscilloscope:



Schematic diagram of internal ground connection when oscilloscope is connected with computer through the port:



When the oscilloscope is AC powered by adapter or connected with AC

powered computer through the port, it is not allowed to measure the primary power supply of power grid.

⚠Warning:

If the input port of the oscilloscope is connected to a voltage with a peak value higher than 42V (30vrms) or a circuit with a peak value of more than 4800 VA, the following measures shall be taken to avoid electric shock or fire:

- Only voltage probes, test wires and adapters with proper insulation attached to the oscilloscope or accessories suitable for oscilloscope instrument series products specified by our company shall be used.
- Before use, check the multimeter test probe, oscilloscope probe and accessories for mechanical damage. If damage available, replace it.
- Remove all unused multimeter test probes, oscilloscope probes and accessories (power adapter, USB, etc.).
- Firstly, plug the power adapter into the AC socket, and then connect it to the oscilloscope.
- When testing in a CAT II environment, do not connect a voltage higher than 400 V to any input port.
- When testing in a CAT II environment, do not connect a voltage with a voltage difference of more than 400 V to the isolated input port.
- Do not use an input voltage higher than the rated value of the instrument. Pay special attention when using 1:1 test wires, because the probe voltage will be directly transmitted to the oscilloscope.
- Do not touch the bare metal BNC or banana plug.
- Do not insert metal objects into the connector.
- Use the oscilloscope only in the specified way.
- The voltage rating mentioned in the "warning" information is the limited value of "working voltage". They represent V ac rms (50-60 Hz) in AC sine wave applications; and V dc in DC applications. CAT is the prefix, and II

refers to the level. Level II is the low voltage and high energy level, which refers to the local electrical level applicable to electrical appliances and portable equipment.

- Do not input any electric such as signal, voltage or current into the GEN O ut port of the signal generator.
- **Only a qualified person should perform internal maintenance.**
- **Check all Terminal Ratings.** To avoid fire or shock hazard, check all ratings and markings on this product. Refer to the user manual for more information about ratings before connecting to the instrument.
- **Do not operate without covers**. Do not operate the instrument with covers or panels removed.
- **Avoid exposed circuit**. Be careful when working on exposed circuitry to avoid risk of electric shock or other injury.
- **Do not operate if any damage.** If you suspect damage to the instrument, have it inspected by qualified service personnel before further use.
- **Do not operate in damp conditions.**
- **Do not operate in an explosive atmosphere.**
- **Keep product surfaces clean and dry.**
- **Using the equipment not in accordance with the method specified by the manufacturer may damage the protection provided by the equipment.**

2. How to Implement the General Inspection

After you get a new oscilloscope, it is recommended that you should make a check on the instrument according to the following steps:

Check whether there is any damage caused by transportation.

If it is found that the packaging carton or the foamed plastic protection cushion has suffered serious damage, do not throw it away first till the complete device and its accessories succeed in the electrical and mechanical property tests.

Check the Accessories

The supplied accessories have been already described in the "Appendix A: List of Accessories" of this Manual. You can check whether there is any loss of accessories with reference to this description. If it is found that there is any accessory lost or damaged, please get in touch with our distributor responsible for this service or our local offices.

Check the Complete Instrument

If it is found that there is damage to the appearance of the instrument, or the instrument can not work normally, or fails in the performance test, please get in touch with our distributor responsible for this business or our local offices. If there is damage to the instrument caused by the transportation, please keep the package. With the transportation department or our distributor responsible for this business informed about it, a repairing or replacement of the instrument will be arranged by us.

3. How to Use the Oscilloscope

The Structure of the Oscilloscope

Front Panel and Keys

The front panel and keys of the oscilloscope are shown in Figure 1:



Figure 1: Front Panel of the Oscilloscope

Description:

1. CH1 and CH2 input connectors.
2. Waveform generator output connector (optional).
3. Display area.
4. The **F1 - F4** keys are multi-function keys. In each menu mode, press the corresponding key to select the corresponding menu item.
5. After pressing the **HOR** key, through the key▲ ▼, you can change the horizontal time base setting, and observe the change of the state information caused by it; it can also be found that the **horizontal time base** display corresponding to the status bar has changed correspondingly; the horizontal displacement of the signal in the waveform window can be adjusted by pressing ◄ ►.
6. Return key. Press this key to return to the previous menu; when the menu is the first level, press the return key to close the menu.
7. Measurement menu key (oscilloscope) or range key (multimeter).
8. Zoom or move key:

   Function of direction keys▲ ▼: used for the up and down movements of waveform, the time base changing, the voltage cursor movements and the trigger of electrical level change in the oscilloscope;

   Function of direction keys◄ ►: used for the left and right movements of waveform, the voltage position changing and the movements of time cursor in the oscilloscope.
9. Automatic setting key (oscilloscope) or automatic range key (multimeter).
10. Stop / run key (oscilloscope) or value hold key (multimeter) or turn on/off the signal output (waveform generator - optional).
11. Input end of the multimeter.
12. Trigger menu key (oscilloscope) or relative value key (multimeter).
13. ⏻: Power switch key.
14. Enter the save settings key.

15. Enter the system settings key.
16. Switch key for working state of oscilloscope and multimeter.
17. CH1 / CH2 - channel switch key.

Side Panel



Description:

1. Probe compensation: 3.3V/1kHz square wave signal output.
2. Charging or USB communication interface.
3. Bracket.

Introduction to the User Interface of the Oscilloscope

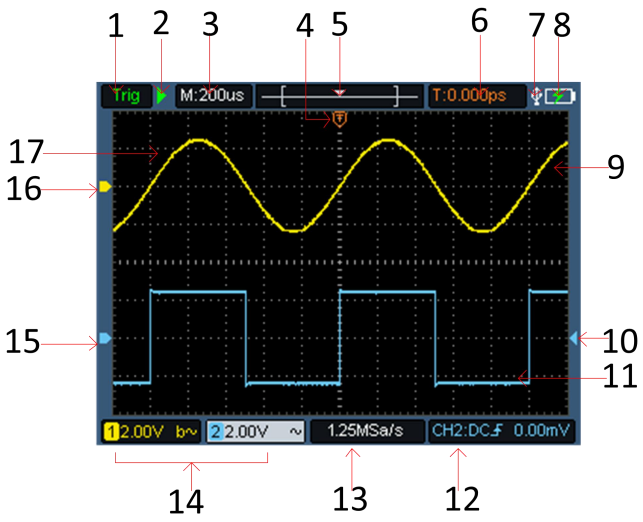


Figure 5: Oscilloscope Interface

Description:

1. The trigger status indicates the following information:

   Auto: Automatic mode. The waveform is being collected without triggering.

   Trig: A trigger has been detected and post trigger information is being collected.

   Ready: All pre trigger data have been obtained and the oscilloscope is ready.

   Scan: Scan mode. Continuously collect and display waveform data.

   Stop: Stop collecting waveform data.

2. Run/stop.
3. Time base display.
4. The pointer indicates the trigger horizontal position.
5. The pointer indicates the trigger position within the current storage depth.
6. Indicating the value of the current trigger horizontal displacement, and displaying the position of the current waveform window in the memory.
7. It indicates that there is a USB disk connecting.

8. Battery power and external power supply indication.
9. Channel 1 waveform.
10. The pointer indicates the trigger electrical level position of the channel.
11. Channel 2 waveform.
12. The icon indicates trigger-related information, including trigger channel, coupling mode, trigger type and trigger electrical level.
13. The current sampling rate.
14. The channel information reading indicates the voltage position of the corresponding channel.

    The icon indicates the coupling mode of the channel:

    "—" means DC coupling;

    "～" means AC coupling;

    "⏚" means ground coupling.
15. The pointer indicates the grounding reference point (zero position) of the waveform displayed in CH2 channel. If there is no pointer indicating the channel, it means that the channel is not open.
16. The pointer indicates the grounding reference point (zero position) of the waveform displayed in CH1 channel. If there is no pointer indicating the channel, it means that the channel is not open.
17. Waveform display area.

Functional Check

Making a quick functional check to verify that the instrument is working properly. Please proceed as follows:

1. Press the switch at the bottom left of the main unit ⏻.

The internal relay will make a slight click. The instrument executes all self-check items, and the startup screen appears. Press the front panel key **System**, the default probe menu attenuation coefficient setting value is **10X**.

2. The switch on the oscilloscope probe is set to 10X and connected with

the CH1 channel.

Align the slot on the probe with the plug on the bayonet nut connector (**BNC**) of the **CH1** connector and insert it, then turn the probe to the right and tighten it. Connect the probe tip and ground clamp to the connector of the probe compensator. Please pay attention to the terminal polarity. The square terminal represents the signal output, and the round terminal represents the reference ground.

3. Press the "Auto" key on the front panel.

Within a few seconds, a square wave display (1kHz/3.3Vpp) can be seen, as shown in Figure 3-1.

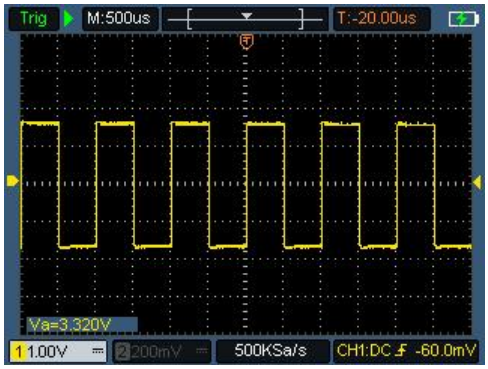


Figure 3-1: Automatic Setting

Repeat steps 2 and 3 on the CH2 channel.

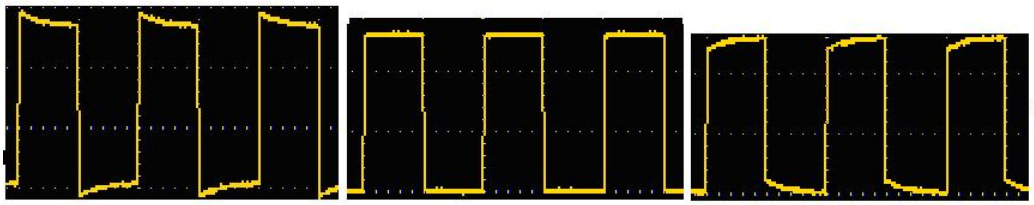
Probe Compensation

When connecting the probe to any input channel for the first time, make this adjustment to match the probe with the input channel. The probe without compensation or deviation compensation will lead to measurement error. To adjust the probe compensation, please follow the following steps:

1. Set the probe menu attenuation coefficient to **10X**, and set the switch on the probe to **10X** (see "Probe Attenuation Coefficient Setting" in P9), and connect with CH1. If a hook probe is used, make sure it is in close contact with the probe. Connect the probe tip to the signal output connector of the probe compensator, and connect the reference wire clamp to the ground wire connector of the probe compensator, and then press the **Auto** key on the front

panel.

2. Check the displayed waveform and adjust the probe until the compensation is correct. See Figure 3-2 and Figure 3-3.



Overcompensation Correct compensation Under-compensation

Figure 3-2: Display Waveform of Probe Compensation

3. Repeat the steps if necessary.

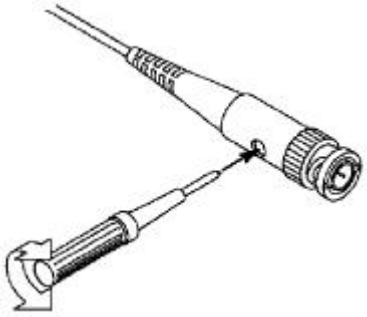


Figure 3-3: Probe Adjustment

Probe Attenuation Coefficient Setting

The probe has a variety of attenuation coefficients, which will affect the vertical position factor of the oscilloscope.

To change (check) the set value of probe attenuation coefficient in the oscilloscope menu, please follow the steps below:

(1) Press the **CH1/CH2** key to switch the channel to be used.

(2) Press the **F3** to select the desired attenuation coefficient. This setting is valid until it is changed again.

> ⚠ **Note:** The preset setting of the probe attenuation coefficient in the menu when the oscilloscope is delivered is 10X. Make sure that the attenuation switch setting value on the probe is the same as the probe attenuation coefficient option in the

oscilloscope menu.

The setting value of the probe switch is **1X** and **10X**. See Figure 3-4.

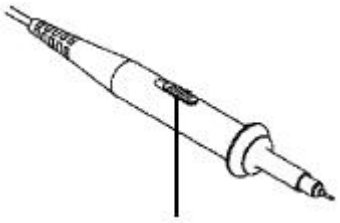


Figure 3-4: Probe Attenuation Switch

Note: When the attenuation switch is set to **1X**, the probe limits the bandwidth of the oscilloscope to **5 MHz**. To use the full bandwidth of the oscilloscope, be sure to set the switch to **10X**.

Safe Use of Probe

The safety ring surrounding the probe body provides a barrier to protect the fingers from electric shocks. See Figure 3-5.

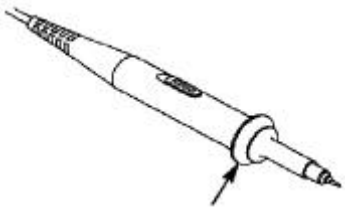


Figure 3-5: Finger Safety Ring of the Probe

Warning: To prevent electric shock when using the probe, please keep your fingers behind the safety ring on the probe body.

To prevent electric shock when using the probe, do not touch the metal part of the probe head when the probe is connected to a voltage source.

Before making any measurements, connect the probe to the instrument and connect the ground terminal to the ground.

4. How to Use the Multimeter

About This Chapter

This chapter introduces the multimeter function of the oscilloscope step by step, and provides some basic examples of basic operations and how to use the menu.

Instrument Interface

The multimeter uses four 4-mm safety banana plug input ends: **A, mA, COM, and** VΩ⊣◁C.

Multimeter interface:



Multimeter Interface

Description:

1. Measurement type indication:

⎓ **DCV**	------	DC voltage measurement
~ **ACV**	------	AC voltage measurement
⎓ **DCA**	------	DC current measurement
~ **ACA**	------	AC current measurement
Ω **Resist**	------	Resistance measurement
⊣◁ **Diode**	------	Diode measurement

Cont ------ On/Off measurement

Cap ------ Capacitance measurement

2.Range indication: **Manual** means manual range; **Auto** means automatic range.

3. Current measurement range.

4. Indicating that there is a USB cable inserted.

5. Battery power indication.

6. “Hold” can keep the current reading on the display.

7. Measurement value and unit.

8. Display of switching resistance, buzzer, diode and capacitance measurement function.

9. The selected range V or mV in voltage measurement; the selected current range A or mA in current measurement.

10. To choose AC or DC voltage measurement.

11. To choose to AC or DC current measurement.

12. Display of relative value measurement function (only available when measuring DC current, DC voltage and resistance).

5. How to Use the Waveform Generator（optional）

The instrument can provide 4 basic waveforms, sine wave, square wave, ramp wave, pulse wave, and 8 arbitrary waveforms.

Connect the output

Press the **Mode** button to switch the instrument interface to the waveform generator function interface. Check whether the upper left corner of the screen is **ON**, if it is **OFF**, press the **Run/Stop** key to switch.
Connect the BNC cable to the port marked **GEN Out** in the top of the oscilloscope.
Warning：

BNC output ports not allowed to input any signal such as voltage, current and other electrical signal, otherwise, it will be burned.



Generator Output Ports

To observe the output of the waveform generator, connect the other end of the BNC cable to the signal input connector of the oscilloscope.

Set the waveform

(1) Press the **Mode** button to switch the instrument interface to the waveform generator function interface.

(2) Press **F1** to select the desired waveform, and the screen will display the corresponding waveform setting menu.

(3) Set the parameters of the desired waveform through the operation panel **F2-F4** and the ▲ ▼ ◄ ►panel keys.

6. Troubleshooting

1. The oscilloscope cannot be turned on.

It may be that the battery is completely exhausted. At this time, even if the oscilloscope is powered by the power adapter, the oscilloscope cannot be turned on. You need to charge the battery first, and do not turn on the oscilloscope. Wait for about 15 minutes, and then try to turn on the oscilloscope. If the oscilloscope still cannot be turned on, please contact us to serve you.

2. The oscilloscope turns off after a few seconds of startup.

It may be that the battery is exhausted. Check the battery symbol at the top left of the screen. ▭ symbol indicates that the battery is exhausted and must be charged.

3. After switching to the multimeter, the measurement type is displayed as E.

It may be that the measurement type was not selected. At this time, press **F4**, the measurement type should display the corresponding measurement type. If E is still displayed, restart the oscilloscope.

4. In the oscilloscope state, the measured voltage amplitude value is 10 times larger or smaller than the actual value.

Check whether the channel attenuation coefficient is consistent with the actual probe error ratio.

5. In the oscilloscope state, there is a waveform display, but it cannot be stabilized.

- Check whether the source item in the trigger mode menu is consistent with the signal channel actually used.
- Check whether the trigger electrical level has exceeded the waveform range. Only by setting the parameters reasonably, the waveform can be displayed stably.

6. In the oscilloscope state, nothing is displayed after pressing

RUN/STOP.

Check whether the trigger mode of the trigger mode menu is normal or single, and the trigger electrical level is out of the waveform range. If so, center the trigger electrical level or set the trigger mode to automatic. In addition, you can press **Auto** to automatically complete the above settings.

7. In the oscilloscope state, the display speed becomes slower when the average value sampling is set in the acquisition mode or the duration is set longer in the display settings.

It is normal.

7. Appendix

Appendix A: List of Accessories

- 1 USB cable
- 2 passive probes
- 1 crocodile clip cable
- 1 set of multimeter probes (one red and one black)
- 1 user manual
- 1 probe correction adjustment knife

Appendix B: Maintenance and Cleaning

General maintenance

Do not store or place the instrument in a place where the LCD screen will be exposed to direct sunlight for a long time.

Caution: Do not let spray, liquid or solvent touch the instrument or probe to prevent damage to the instrument or probe.

Cleaning:

Check the instrument and probe frequently according to the operation. Clean the external surface of the instrument as follows:

1. Please wipe the floating dust outside the instrument and probe with a soft cloth. When cleaning the LCD, be careful not to scratch the transparent LCD protection screen.

2. Wipe the instrument with a damp but non dripping soft cloth. Please disconnect the power supply. It can be scrubbed with soft detergent or water. Do not use any abrasive chemical cleaning agent to avoid damaging the instrument or probe.

**Warning**: Please make sure the instrument is dry before re-energizing

to avoid electrical short circuit or personal injury caused by moisture.

Charging and Replacement of Battery

During the long-term storage of the device, the battery may be too low due to the self-discharge of the lithium battery and the device cannot be turned on. This is a normal phenomenon.

Please use the attached adapter to pre-charge the device for 0.5 to 1 hour (depending on the storage time) before turning it on. In addition, if the device is not used for a long time, it is recommended to charge it at regular intervals to avoid over-discharge of the lithium battery.

Battery Charging

The lithium battery may not be fully charged when delivered. To make the battery be charged, refer to the following table to charge and discharge:

Model	Charging	Discharging
For models＜100MHz	≥4.5h	≥4h
For models≥100MHz	≥4h	≤3h

The power supply and battery indicator symbols in the upper right corner of the screen are explained as follows:

 symbol indicates the power-on charging status;

 symbol indicates battery power supply;

 symbol indicates that there is only about five minutes of use time left. Please charge as soon as possible according to the relevant tips to avoid damage to the battery.

Charging Method

Charging the battery through the power adapter: Connect the oscilloscope to the power socket through the USB data cable and power adapter delivered with the machine for charging.

Charge the oscilloscope through the USB interface: Connect the oscilloscope to a computer or other equipment through a USB data cable for charging (pay attention to the load capacity of the power supply equipment to avoid

abnormal operation of the equipment).

Note

To avoid overheating of the battery during charging, the ambient temperature must not exceed the allowable value given in the technical specifications.

Replacement of Lithium Battery

Generally, the battery does not need to be replaced. However, when necessary, it can only be replaced by qualified personnel, and only **lithium batteries of the same specification** can be used.